

## NASO-ORBITO-ETHMOID FRACTURES: PERSPECTIVE AND PRACTICES OF NIGERIAN SURGEONS

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### ABSTRACT

**Objective:** The study was to appraise the level of expertise in the management of Naso-Orbito-Ethmoid (NOE) fractures and to provide recommendation for necessary improvement in an African population.

**Materials and Methods:** A questionnaire was designed and electronically mailed to Nigerian Oral & Maxillofacial surgeons, Plastic and Reconstructive surgeons, and Ear, Nose and Throat surgeons to assess their perspectives and practices in the diagnosis and management of NOE fractures. Further administration of questionnaire was done at the AO (Association of Osteosynthesis) principle course in Lagos, January, 2010. Information generated were coded and processed with statistical package for Social Sciences version 15.0, Chicago Illinois, USA.

**Results:** The questionnaire was delivered to 214 surgeons, there were 112 respondents out of which 78 expressed no interest in the management of NOE fractures and 34 had interest and so completed the questionnaire.

Diagnosis is largely based on plain radiographs; only 22 surgeons perform NOE trauma surgery, majority (63.9%) use existing laceration or more conservative approaches like Lynch or open sky incisions. Mini and micro-plates are employed by only 31.8% of the surgeons. Bone grafting is rarely performed but when required, the iliac crest is preferred. Repair of the nasolacrimal duct system is rarely done.

**Conclusion:** The management of NOE fractures in Nigeria, falls short of the current best evidence in the world literature. International collaboration for improvement is recommended.

**Keywords:** nasoethmoid complex, diagnosis, treatment, complications

### INTRODUCTION

Naso-Orbito-Ethmoid (NOE) fractures are arguably the most difficult facial fractures from diagnostic and therapeutic points of view.<sup>1</sup> This is largely because the anatomic region consists of an intricate articulation of several small bony processes of the frontal, nasal, maxillary, lacryma, vomer, ethmoid and sphenoid bones. It incorporates delicate structures such as the nasolacrimal drainage system and medial canthal ligaments.<sup>2</sup> The region is contiguous with vital anatomical areas including the anterior cranial fossa, the orbit and their respective contents. Because of the functional and aesthetic implications of injuries to this region, appropriate, timely and adequate diagnosis and treatment is crucial to avoid unfavourable sequelae which are often difficult or sometimes, impossible to correct.<sup>3,4</sup>

Longitudinal studies on the outcome of management of NOE complex fractures are generally rare in the

world literature.<sup>3</sup> Anecdotal evidences and case reports are mostly found.<sup>5,6</sup> However, no publication of Nigerian origin documenting experience in the management of NOE fractures was found following a rigorous electronic and manual library search. On the other hand, the author has encountered a sizable number of patients presenting with secondary deformities resulting from improperly diagnosed and inadequately treated NOE complex fractures in Nigeria. Therefore, this study was embarked upon to assess the level of knowledge and appropriateness of management of NOE complex fractures in the country. Measures to improve the quality of care are recommended based on the findings of this study.

### METHODOLOGY

We performed a literature search to identify the major surgical specialties involved in the management of Naso-Orbito-Ethmoid complex fractures all over the

world. Three groups of specialists were identified namely Plastic surgeons, Otorhinolaryngologists and Maxillofacial surgeons. Hence, the lists of names and electronic mail addresses of surgeons in these three areas of specialization in Nigeria were obtained from the register of the National associations of the respective professional groups. These are Nigerian Association of Oral & Maxillofacial Surgeons (NAOMS), Nigerian Association of Plastic, Reconstructive and Aesthetic Surgeons (NAPRAS), and Oto-Rhino-Laryngology Society of Nigeria (ORLSON).

SPECIALTY ↓	PERCENTAGES →			
	<5%	6-10%	11-20%	>20%
ENT	1	2	2	-
Plastic	-	-	3	-
OMS	13	8	4	-

**Table 1:** Percentage of Craniofacial Fractures Constituted By NOE in Specialty Practice

A questionnaire was designed and mailed electronically to members of the associations and they were requested to complete and send back the questionnaire to the author by electronic mails. A recipient who does not have interest in the treatment of NOE trauma was asked to simply reply the mail stating the phrase "NO INTEREST". It was also emphasized that no reply to mail will be interpreted as lack of interest in the subject. Three reminders (each time with attached copy of the questionnaire) were sent to the recipients at one month intervals. E-mail delivery confirmations were received in all cases. The whole process of sending and receiving feedbacks spanned a period of one calendar year. Furthermore, administration of questionnaire was done at the AO principle course in Lagos, January, 2010 where a number of Oral & Maxillofacial surgeons, plastic surgeons and ENT surgeons participated. Other questionnaires were administered by ordinary mails and personal contacts at some teaching hospitals in 2011.

PERSPECTIVE	OPINION EXPRESSED		
The incidence of NOE fracture in Nigeria is under reported due to missed diagnosis	True	23 (69.7%)	
	False	4 (12.1%)	
	No Opinion	6 (18.2%)	
NOE is the most difficult Facial fracture to manage	True	17 (51.5%)	
	False	6 (18.2%)	
	No Opinion	10 (30.3%)	
A large proportion of NOE fractures require no intervention	True	10 (30.3%)	
	False	15 (45.5%)	
	No Opinion	8 (24.2%)	
For proper diagnosis of NOE fractures, CT scan is mandatory	True	14 (42.4%)	
	False	13 (39.4%)	
	No Opinion	6 (18.2%)	
Early and aggressive treatment of NOE fractures gives the best outcome	True	19 (57.6%)	
	False	7 (21.2%)	
	No Opinion	7 (21.2%)	
Late presenting NOE fractures should not be treated because it always gives poor outcome	True	3 (9.1%)	
	False	20 (60.6%)	
	No Opinion	10 (30.3%)	
NOE fractures is best treated by which specialty	OMS:	4 (12.1%)	
	ENT:	9 (27.3%)	
	Plastic:	14 (42.4%)	
	Joint:	1 (3.0%)	

**Table 2:** Perspectives of Nigerian Surgeons on the Management of NOE Fractures

The questionnaire was divided into 2 sections requesting information on 'Perspectives' (Section A) and 'Practices' (Section B) of the surgeons. All responses were collated while completed questionnaire were coded and analyzed using SPSS for Windows Version 15.0, Chicago, Illinois, USA.

## RESULTS

A total of two hundred and fourteen specialists received the questionnaire. This include; 67 Oral and Maxillofacial Surgeons (OMS), 66 Ear, Nose & Throat (ENT) Surgeons, and 81 Plastic surgeons (PS). Twenty

five out of the 67 (37.3%) Oral & Maxillofacial Surgeons, 5/66 (7.6%) Ear, Nose & Throat Surgeons and 3/81 (3.7%) Plastic Surgeons expressed interest and returned completed questionnaires. In addition, 28 ENT Surgeons, 38 Plastic Surgeons and 13 Oral and maxillofacial surgeons replied the mail stating "NO INTEREST" while the remaining 102 recipients did not respond at all and were therefore assumed to be uninterested in the subject. Altogether, there were 112/214 respondents giving a response rate of 52.3% in the study, but only 34/214 (15.9%) actually expressed active interest in NOE management, therefore

PRACTICES		RESPONSES
1	Do you surgically treat NOE fractures?	YES 22 (66.7%) NO 11 (33.3%)
2	How do you establish radiographic diagnosis	CT 5 (15.2%) Plain film 28 (84.8%)
3	Type of NOE fractures most frequently encountered	Type 1 19 (57.6%) Type 2 5 (15.2.3%) Type 3 4 (12.1%) Unable to distinguish 5 (15.2%)
4	Preferred surgical approach	Coronal 4/22 (18.2%) Lynch 6/22 (27.3%) H-incision/open sky 10/22 (45.5%) Transconjunctiva 2/22 (9.1%) Existing laceration, if present 14/22 (63.6%)
5	Methods of reconstituting vertical and horizontal buttresses	Micro- or miniplates 7/22 (31.8%) Interosseous wire 13/22 (59.1%) External splints 6 /22 (27.3%)
6	What percentage of cases do you perform bone grafting of the buttresses, medial wall or nasal dorsum?	None 17/22 (77.3%) <5% 3/22 (13.6%) 6 – 10% 2 /22 (9.1%)
7	Preferred source of nasal bone graft	Calvaria 6 /22 (27.3%) Rib 3 /22 (13.6%) Illiac 12/22 (54.6%) Chin 1 /22 (4.5%)
8	Do you perform lateral cantholysis to enhance medial canthopexy?	Yes 2 / 22 (9.1%) No 20/22 (90.9%)
9.	Do you perform transnasal wiring of the medial central fragment?	Yes 5/22 (22.7%) No 17/22 (77.3%)
10.	How frequently do you stent the nasolacrimal duct?	Never 12 /22 (54.6%) Rarely 6 /22 (27.3%) Occassionally 2/22 (9.1%) Frequently 2 /22 (9.1%) Always 0 /22 (0%)
11.	How frequently do you repair the nasolacrimal duct?	Never 17/22 (77.3%) Rarely 4 /22 (18.2%) Occassionally 1/22 (4.5%) Frequently 0 (0%) Always 0 (0%)
12	How frequently do you perform dacrosystorhinostomy?	Never 16/22 (72.7%) Rarely 4 /22 (18.2%) Occasionally 1/22 (4.5%) Frequently 1/22 (4.5%) Always 0 /22 (0%)

**Table 3:** Practices of Nigerian Surgeons on the Management of NOE Fractures

completed the questionnaire. One of the completed questionnaires was excluded because the respondent practices in Egypt, i.e. outside Nigeria. Hence 33/214 questionnaires were valid for analysis.

The age range of respondents was 34-57 years, the median age being 42 years. There were 28 males and 5 females, thus, male to female ratio was 9.3:1. The years of specialty experience ranged from 1 to 23 years, with an average of 8 years. Majority of respondents (30/33, 90.9%) work in public hospitals while minority (3/30, 9.1%) are into private practice.

### Perspectives

The questionnaire inquired to know the proportion of NOE complex fractures among all craniofacial fractures encountered by the specialists. Majority declared less than 5% (Table 1); when cross tabulated with specialty types, the ENT and Plastic surgeons tend to report higher percentages. However, a greater proportion of the surgeons believe that the incidence of NOE fractures is generally under reported due to missed diagnosis (Table 1).

Greater than 50% of the surgeons believe that NOE complex fractures are the most difficult facial fractures to manage (Table 2). A similar proportion believe that early and aggressive treatment gives the best outcome

diagnosis (Table 2). Variable number of surgeons expressed no opinions in most of the inquired perspectives (Table 2).

When asked which specialty is most appropriate to manage NOE complex fractures, most respondents believe the Plastic surgeons, followed by the ENT surgeons are the most appropriate. Notably, one respondent submitted that a joint multidisciplinary arrangement involving the three specialties should be preferred (Table 2).

### Practices

A summary of the practices of Nigerian surgeons in the management of NOE fractures are presented in Table 3. Out of the 33 surgeons interested in NOE fracture managements, 22 (66.7%) actually surgically intervened while 11 (33.3%) do not perform NOE trauma surgery but simply refer when surgery is indicated. A significantly large proportion of the surgeons (84.8%) employ plain radiographs in diagnosing NOE complex fractures while only 15.2% use computed tomography (CT). Most surgeons claim to encounter Markowitz class I type of fractures mostly while 15.2% admitted inability to distinguish the types of fractures radiographically (Table 3).

Type of Complication	Untreated cases	Treated cases
Persistent telecanthus	25	23
Unfavourable scar	13	17
Lacrimal obstruction & epiphora	12	16
Infection	5	9
Ectropion	4	3
Nerve injury	1	6
Eye lid lax & scleral show	4	2
Frontonasal duct impingement	6	5

NB: The values represent the number of surgeons that indicate each complication among the three most frequently encountered.

**Table 4:** Experiences of Nigerian Surgeons with Complications of NOE Fractures

and that late presenting cases should still be treated as they do not necessarily produce poor results. Opinions were fairly evenly divided as to the proportion of NOE fractures that require no treatment; while 45.5% of surgeons believe most cases will require surgical intervention, 30.3% believe most cases should be treated conservatively. Almost equal number (14 vs. 13) of respondents supports CT scan and plain radiograph respectively as the standard model for

In approaching the fractures surgically, most (63.6%) of the twenty-two surgeons who perform NOE trauma surgery will prefer an existing laceration if present. In the absence of one however, the open sky incision or the lynch incision are mostly employed. Majority (59.1%) uses interosseous wires to fix fragments of the vertical and horizontal buttresses while 31.8% employ micro- or miniplates. Over 77% of surgeons never had reasons to graft the nasal

dorsum or medial orbital wall while 13.6% do so in less than 5% of cases. Should there be need to graft, the iliac crest or calvarium is the preferred sources of bone graft. Only 9.1% of the surgeons routinely perform lateral cantholysis to achieve medial canthopexy. About 23% of surgeons wire the central fragment that bears the canthal tendon transnasally. Most of the surgeons never or rarely stent the nasolacrimal duct, repair it or perform dacrocystorhinostomy (DCR). One surgeon frequently performs DCR. Persistent telecanthus, unfavourable scars and lacrymal obstruction are the three most frequently observed complications of both surgically treated and untreated NOE complex fractures in Nigeria (Table 4).

## DISCUSSION

Based on the findings of this survey, it is clear that only few surgeons manage NOE trauma in Nigeria and the Oral and maxillofacial surgeons are mostly involved. This is unlike the case in most countries in Europe and America where Ear, Nose and Throat (ENT) surgeons and Plastic surgeons play prominent roles.<sup>3,7,8</sup> This observation underscores a shortcoming in the curriculum for specialty trainings in Nigeria whereby plastic surgery and ENT trainees have very little or no exposures to craniofacial fracture management. The ENT surgeons generally restrict to frontal sinus fractures while mid face and mandibular fractures are almost exclusively treated by oral and maxillofacial surgeons. By this observation, the need for extensive cross rotation of trainees among surgical specialties operating in the cranio-maxillofacial region becomes evident.

Although, it is popularly agreed that the incidence of NOE fractures is underreported due to missed diagnosis, most of the surgeons reported encountering less than 5% among all types of craniofacial fractures. Relatively, the few Plastic and ENT surgeons involved tend to report higher incidences of greater than 10%. This is attributable to the fact that these specialties encounter fewer cases of craniofacial fractures of which NOE fractures feature prominently. Most Nigerian surgeons share popularly held views about NOE complex fractures including the facts that it is perhaps the most difficult facial fractures to treat, and that early and aggressive treatment should be preferred to delayed intervention.<sup>1-4,9,10</sup> They also believe that late presenting cases can still be treated with optimal result. Despite the greater number of Oral & Maxillofacial respondents, most participants believe that the Plastic surgeons should be in the forefront of NOE trauma care while the Oral and Maxillofacial surgeons should be least involved. However, what obtains in the developed world is that any of these specialists who

are adequately trained in craniofacial surgical techniques embarks on NOE trauma surgery. In fact, according to the presentation of Prof Michael Ehrenfeld at the first AO Principle course in Nigeria on March 01, 2010, the international membership of AO-CMF (Association for Osteosynthesis – Cranio-Maxillofacial group) is comprised majorly by Maxillofacial surgeons. It is therefore surprising that Nigerian Oral and Maxillofacial surgeons expect to take the back seat in NOE trauma care. One individual opined that no single specialty should manage alone, rather; a joint management by the three, including an ophthalmologist, should be advocated. This opinion, though reasonable, in the author's view; where individual specialists are adequately trained and exposed in craniofacial surgical techniques, such a joint approach may be restricted only to highly complicated cases.

Surprisingly, majority of the surgeons disagree that computed tomography is mandatory for optimal diagnosis and treatment planning of NOE trauma surgery. Most of them still base their diagnosis and treatment on plain radiographs. This is contrary to the best practice and has significant implications in that the ability to distinguish fracture patterns is doubtful and the likelihood of under diagnosis and inadequate treatment is high.<sup>2,4,9,11,12</sup>

Injuries to the NOE region typically results from a forceful blunt impact to the central aspect of the mid face mostly from motor vehicle accidents and assaults, in which case, it is often associated with other types of facial fractures.<sup>1,3,9</sup> Isolated injuries to the NOE region may result from high energy impact from a small object to the central mid face such as obtained in some sports like tennis, hockey, and boxing.<sup>9,13</sup> Successful treatment depends on prompt and proper diagnosis and evaluation of the extent of injury as well as sufficient expertise in the very technical aspects of reconstituting the skeletal framework and the functional anatomic structures in the region.<sup>1,4,9</sup>

The key physical findings are often severe orbital swelling, periorbital ecchymosis, traumatic telecanthus and CSF rhinorhea. Central midface retrusion/intrusion becomes evident after subsidence of acute oedema.<sup>3,4,9,14,15</sup> Thin-section computed tomography is generally regarded as the gold standard in defining the pattern of NOE fractures, the extent of adjacent fractures as well as for treatment planning.<sup>2,11,12</sup>

Wide surgical exposure is advocated to facilitate unlimited access to adjacent fractures and access to bone graft from the calvarium.<sup>16-18</sup> Meticulous reduction and stabilization of the fracture fragments must be ensured using the techniques of craniofacial surgery.

The horizontal buttresses made up by the superior and inferior orbital rims must be reduced and stabilized with micro- or mini-plates, the internal orbital wall, particularly the medial wall, and fronto-maxillary pillars must be reconstructed and bone grafted if necessary.<sup>9,18</sup> Key to the repair is the proper medial restoration of the central fragment and canthal tendon by transnasal wiring especially in Markowitz type II and III fractures, thereby, correcting the traumatic telecanthus.<sup>2,8,18</sup> Where there is loss of nasal support, a bone graft, preferably from the calvarium is used to restore the nasal contour and provide support to the soft tissue.<sup>9,18</sup>

It was observed that the practices of Nigerian surgeons do not necessarily follow the above fundamentals. Diagnosis is largely established solely on plain radiographs. The reason often adduced for failing to employ computed tomography is availability and cost. This reason, in the author's opinion, is no longer tenable because facilities for CT scan are currently available in many tertiary hospitals in Nigeria to where patients can be referred. Also, the cost of repeated surgeries and of managing complications resulting from inadequate initial treatment far exceeds the cost of CT scan. In any case, CT scan is invariably required to diagnose and correct secondary deformities. At least, over 15% of the surgeons insist on CT scan and do get their patients to do it. The author believes that painstaking and comprehensive explanation to patients will convince them of the importance of making fund available for necessary investigations in majority of cases.

In Nigeria, most surgeons would approach the naso-orbito-ethmoid region from an existing laceration, and where this is not present or adequate, majority employs the open sky or lynch incision. While these are possible options, the coronal incision have been found most useful by most surgeons in the western world.<sup>17,18</sup> In this study, only 18.2% of the surgeons use coronal incision. The coronal incision provides very wide exposure of the entire frontal and NOE anatomic region.<sup>2,4,7,16-19</sup> It provides access to the medial, superior and even lateral orbital walls where concomitant fractures requiring treatments may be present. It can be easily combined with transconjunctival, subciliary or mid-lower eyelid incision to facilitate simultaneous exposure of the orbital floor.<sup>17,19,20</sup> The exposure also provides single access to calvaria graft donor site and graft recipient site.<sup>19,21</sup> Also, the coronal incision scar can be carefully hidden within a hairy scalp; which in black Africans, is readily obtainable among women. African men naturally have short hairs, and so, it may not be as hidden as it could be among American and European men. However, it can be easily disguised with a cap. These advantages are not obtainable with the more conservative open sky and lynch incisions.<sup>5,16</sup>

Most surgeons in this study will reconstitute the vertical and horizontal buttresses using interosseous wires while a few surgeons would use micro- and mini-plates. These two methods are generally accepted.<sup>2,4,9</sup> However, the use of interosseous wire is fraught with some disadvantages because the bones have to be inevitably displaced to pass and receive the wires through tiny fragments of bones.<sup>9</sup> Hence, use of plates should be encouraged. A minority of surgeons still employs external splint, this should be discouraged as outcomes with such modality has been found to be generally unsatisfactory.<sup>9,19</sup>

Bone grafting of the buttresses, medial orbital wall or nasal dorsum is performed in less than 10% of cases by few surgeons while majority never graft. The iliac crest bone is mostly preferred by the few surgeons who perform grafting. On the contrary, there is conclusive evidence supporting the use of calvarial bone for nasal grafting.<sup>18,21-23</sup> The outcome is generally better and long-lasting compared to the iliac crest.<sup>17,22</sup> It is likely that most of these surgeons are not sufficiently skilled in developing coronal flaps and harvesting split thickness calvarial grafts. The use of iliac crest necessitates an additional surgical site and thus increases morbidity and yet, does not ultimately give comparable result.<sup>17,22</sup> This is another area of deficiency in NOE trauma surgery among Nigerian surgeons.

Some surgeons perform lateral cantholysis in order to facilitate sufficient medial repositioning of the medial canthal tendon.<sup>24</sup> This is not generally accepted because many others have been able to achieve adequate correction of traumatic telecanthus and proper eyelid apposition to the globe without relieving the lateral canthal tendon. In the author's opinion, lateral cantholysis may become appropriate in delayed intervention or secondary procedures whereby the retraction and adhesion of the medial canthal tendon causes resistance to medial pull. In the case that early and aggressive intervention has been adopted, it should be relatively easy to restore the intercanthal distance and achieve medial canthopexy by appropriate transnasal wiring technique without lateral relief. Most (90.9%) Nigerian surgeons do not practice lateral cantholysis.

However, it is worrisome that most (77.3%) Nigerian surgeons do not also perform transnasal wiring of the medial canthal tendon and central fragment. One wonders how correction of telecanthus was being achieved without this maneuver. Could this be because, most cases were diagnosed as Markowitz type I, in which case there is no comminution, and plating the

sizable central fragment to intact surrounding bone of the buttresses may suffice.<sup>3,14,26</sup> On the other hand, could it be due to lack of expertise in the knowledge and skill to perform transnasal wiring? A prospective evaluation of long term outcome of treatment among the population is desirable to verify the adequacy of their techniques.

The management of the nasolacrimal drainage system though crucial, is highly technical and difficult.<sup>4</sup> It should not be embarked upon by an untrained hand, because, the consequences of a shoddy manoeuvre could be more gruesome than the one not tampered with.<sup>4,9</sup> It is not surprising therefore that in most cases, the Nigerian surgeons will neither stent nor repair the duct. A few surgeons rarely perform dacrocystorhinostomy while one surgeon always performs dacrocystorhinostomy to pre-empt any complications to the drainage system. Since there are no longitudinal or prospective documentations of long term outcomes of NOE management among the Nigerian population, the volume of late complications from inadequately treated nasolacrimal duct injuries is not yet known. However, the author and many of the respondents have seen many patients presenting with features of late lacrimal obstructions and epiphora.

The management of trauma to the NOE region is very challenging, even in the best hands, it is not unusual to have late complications in some patients.<sup>1,4,9</sup> While some of these complications might be unavoidable, inadequate treatment may contribute to the frequency and severity of complications in some patients. The three complications most frequently encountered by Nigerian surgeons are Traumatic telecanthus, unfavourable scars and late lacrimal obstruction and epiphora. To a large extent, these three complications can be avoided or at least minimized by following a standard approach to establish proper diagnosis and institute adequate treatment. In fact, appropriate referral may be the best a surgeon can offer rather than suboptimal intervention that leaves the patients perpetually incapacitated.

This survey has exposed certain limitations in the management of NOE trauma in Nigeria. There is an obvious need for capacity development in this most populous black African country to enhance trauma care and specifically, difficult cases like NOE complex injuries. The need to restructure the curriculum for Head and Neck surgical specialties to incorporate adequate cross postings among senior surgical residents in related surgical specialties is made evident. Also, the author recommends a period of foreign exposure for trainees through international fellowship programmes. This will expose surgeons to knowledge and skills that are not

locally available, it will reduce the bad effect of in-breeding which limits the exposure of a trainee to whatsoever the old trainer had been exposed to.

It is desirable that Specialty associations in the developed world will partner allied associations in the developing world to develop programmes that enhance cross breeding of surgical specialists for equitable distribution of knowledge and skills around the world. This will ultimately reduce international referrals and save some developing country a vast amount of foreign exchange expended on medical tourism by their citizens.

Thankfully, the first principle course of the AO/ASIF Crano-Maxillo-Facial in West Africa held in Nigeria between March 01 - 03, 2010, under the chairmanship of Professor Michael Ehrenfeld (President AO-CMF International). There, considerable number of Nigerian plastic surgeons, ENT surgeons and Oral and Maxillofacial surgeons were taught the current principles in craniofacial trauma care including the management of the NOE complex trauma. Opportunities for international fellowships in craniofacial trauma were opened up. It is desirable that other established International Surgical organizations will follow this example to enhance capacity building in essential aspects of surgical care in the developing countries. This initiative of the AO-CMF will hopefully form the foundation for the development of Crano-Maxillofacial surgery specialty in Nigeria. This will draw interest from among Nigerian Plastic surgeons, ENT surgeons, Oral and Maxillofacial surgeons and perhaps, Neurosurgeons.

In conclusion, this study has shown that expertise in NOE trauma care in Nigeria is suboptimal. Suggested measures to improve care include modification of curriculum and encouraging international partnership for capacity building. Considerations should be given to the development of Crano-Maxillofacial surgical specialty in Nigeria.

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